THE WESTERN GAS CONSTRUCTION CO.

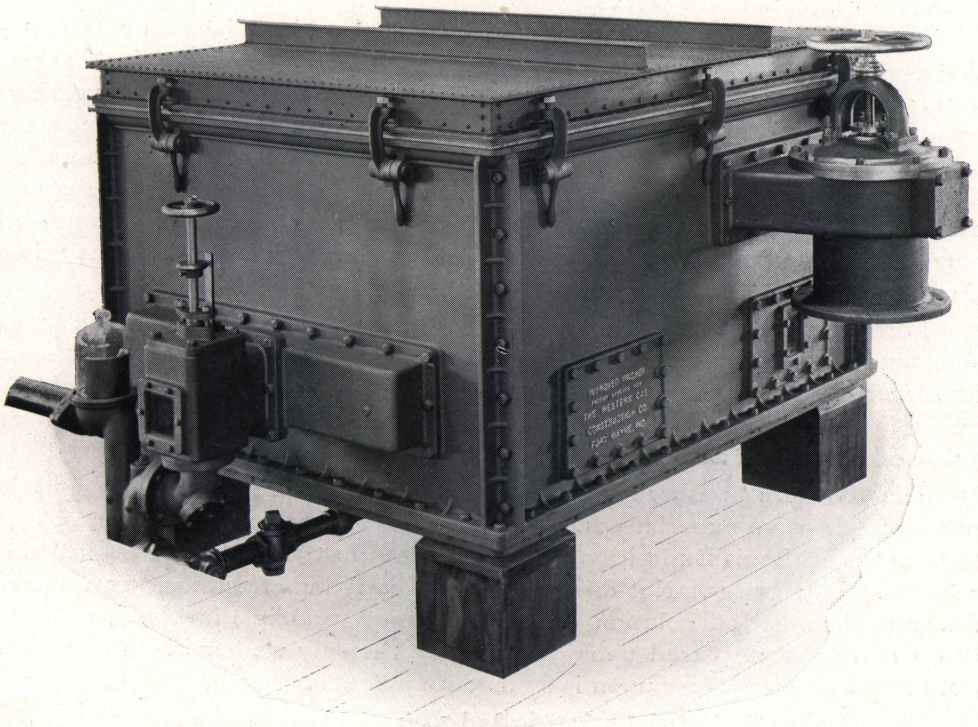
GAS ENGINEERS AND BUILDERS

SAN FRANCISCO FORT WAYNE, IND. NEW YORK

Bulletin No. 202.

MULTIPLE AMMONIA WASHERS

(PATENTED)



FOR EXTRACTION OF CHEMICAL AND MECHANICAL IMPURITIES OF COAL GAS.

AWARDED

GRAND PRIZE AND GOLD MEDAL,

LOUISIANA PURCHASE EXPOSITION,

ST. LOUIS, 1904.

By Jury of Gas Engineers and Managers of International Reputation.

All gas engineers agree that a washer of some sort should precede the scrubber.

The purpose of such an apparatus is the preliminary treatment of the gas by the liquor from the scrubber for removal of ammonia and mechanically suspended matter.

Increase Capacity Scrubbers Purifiers.

The large percentage of ammonia (NH_3) here absorbed materially increases the strength of the liquor, while the consequent removal of carbon dioxide (CO_2) and sulphuretted hydrogen (H_2S), increases proportionally the efficiency and capacity of the scrubbers and purifiers. The washer also enables the tar extractor or other apparatus to be temporarily by-passed without risk, in case of changes or repairs in the works.

It is needless to say that the ammonia washer should not be a tar extractor—that function properly belongs to an apparatus especially designed for that purpose, such as the "Western" special design of *Pelouze and Audouin tar extractors*, by which the tar vapor is separated *at a period and under temperature* conditions, *when its separation does not affect the commercial value of the gas*, and the tar is delivered to tar well as commercial tar *and not as an emulsion* requiring subsequent care and treatment for separation, as must necessarily be the case in any arrangement of combination tar and ammonia washer. (See our Bulletins "Coal Gas" and "P. & A. Tar Extractors.")

Formerly immersion washers of various types were used ahead of the scrubbers, but they did not secure *the minute subdivision of the gas*, which is necessary for *chemical* efficiency in removal of NH_3, CO_2 and H_2S, or *mechanical* efficiency in the removal of soot and oils. *Please bear this in mind as essential requirement in a perfect washer.*

The "Western" washer is a development of these correct principles, and the result of extensive experiments. The series of washer ducts, shown at our exhibit at the St. Louis Exposition, is an excellent illustration of the evolution of a successful apparatus. Not discouraged by early imperfections, we adhered firmly to the practical solution of the theoretical principle involved, with the result that we have placed upon the market the only washer which meets the rigid requirements placed upon it by modern practice.

Patents

The washer (U. S. Patents 677865 and 764049), consists of a rectangular box containing a number of cast iron *distributing ducts* closed at the back. The open end is bolted to a steel apron forming the inlet chamber of washer, into which the gas enters and passes into the ducts through their open ends; then, under the serrated edges of the washing ducts located between the distributing ducts. The term "distributing" implies that the purpose of the ducts is only to spread the gas evenly along the perforated sheets. This is accomplished principally by the serrated edges, but also by the perfect alignment of the ducts. Attention must be called, however, to the fact that the contact between gas and liquor is here precisely all that is secured by washers of the Cathel and similar types but which forms only the "preliminary action" in our washer.

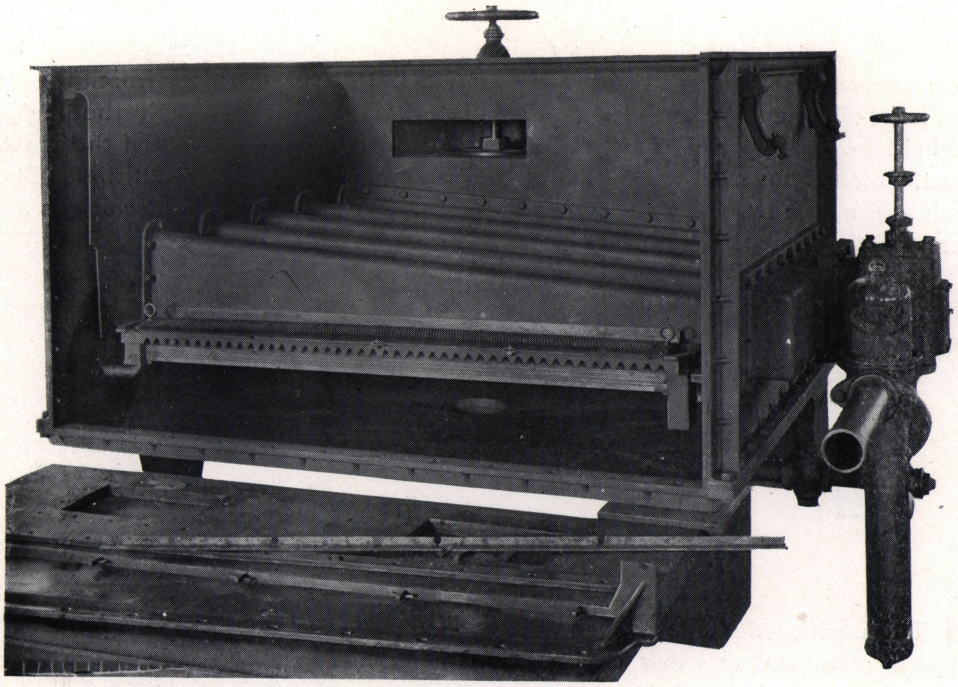


Fig. 2

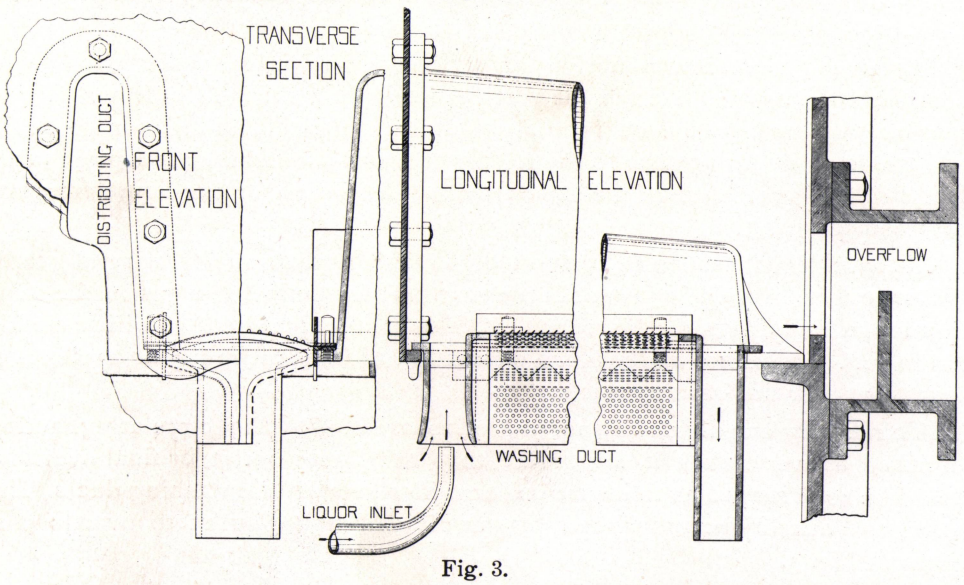


Fig. 3.

The washing duct proper is composed of three perforated sheets held on each side between two steel angles, arranged as shown in Figure No. 3. Observe that the ducts may be easily removed or replaced, as they are secured by wedges passed through slotted posts.

Subdivision of the Gas.

It will be noted that the gas, in reaching the outlet compartment is subdivided by the serrated, submerged edges of the distributing ducts, under which it must first pass, when a second division takes place in its passage through the perforated sides of the washing duct and finally through the perforations of the crown sheet, which is covered by the washing liquor in a high state of ebullition. This justifies the name "*Multiple Washer*" and secures the intimate contact of gas and water particles, necessary for its *chemical* and *mechanical* operation.

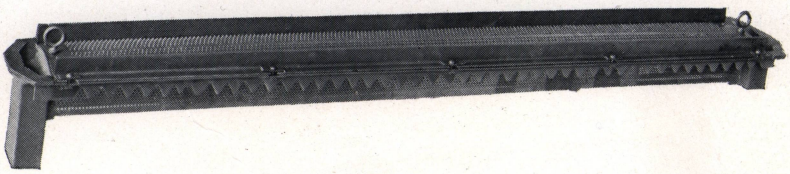


Fig. 4

Circulation of Liquor.

The washing ducts, as shown on figures 3 and 4 have at front and back ends vertical channels or tubes, by which arrangement another very important object is secured, *a repeated circulation of the liquor over the entire length of the washing ducts*, thereby materially increasing the *chemical* efficiency of the washer. This circulation of the liquor is positively secured:—

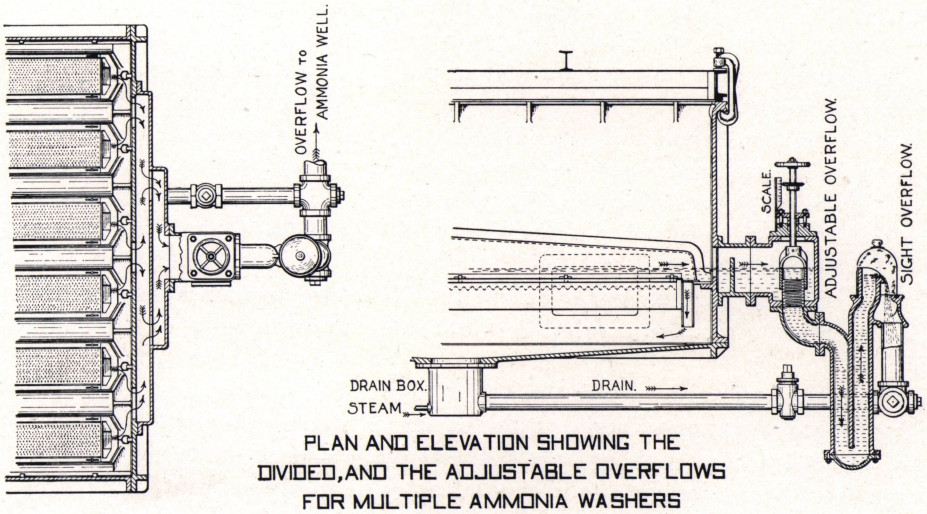
First: By our special design of divided liquor inlet, which consists of tubes placed one under each of the vertical circulation channels in front. These tubes bent upward, as shown in Figure 3, form, so to say, an injector which directs the fresh liquor at once to the region of the washer where absorption takes place and also produces, at the same time, a circulation of the liquor from the lower compartment.

Second: By the special method of punching crown sheets, winged guards or lips are formed pointing towards the rear. These deflect the gas in the same direction, which drives the liquor with it. This feature produces, as will be clearly seen in Fig. 3, a *positive and repeated* circulation of the entire liquor contents of the washer over the washing ducts.

Divided Overflow.

Third: By our divided liquor outlet to overflow. The circulating action described above makes it important that the liquor outlet, or final overflow, should be so arranged as to insure uniform flow over all the washing ducts. This has been admirably accomplished by our divided liquor outlet to overflow, as shown in Fig. 5.

Between each two washing ducts are provided outlet openings into the intermediate overflow box, which again has a divided outlet, located for uniform flow into final chamber in which the adjustable overflow is located.



PLAN AND ELEVATION SHOWING THE DIVIDED, AND THE ADJUSTABLE OVERFLOWS FOR MULTIPLE AMMONIA WASHERS

FIG. 5.

Adjustable and Sight Overflow.

The overflow, as shown in Fig. 5, permits by its handwheel a raising or lowering of the overflow proper, so as to give any desired seal over the crown sheets, as indicated by the pointer and scale. Each washer is also provided with a differential gauge and windows on side of box and overflow, by means of which internal conditions may be observed at any time.

The bottom plate is made in the shape of a shallow inverted pyramid with a drain pot at the apex, and into which all heavy matter removed from the gas by the apparatus will collect, as is also shown in Fig. 5, the drain pot provided with drain and steam connection for cleaning out.

Drain.

One of the strongest points in any gas apparatus is ease of access to all parts. Reference to the illustrations in this Bulletin will show that the "Western" *Multiple Ammonia Washer* is entitled to our claim of superiority in this respect. Not only are the usual manholes placed conveniently on the sides of the box, but the cover, instead of being fastened down with numerous bolts, is secured by clamps and absolute tightness insured by use of a special rubber seal similar to that successfully employed in our *dry seal purifier cover design.* (See Purifier Bulletin.)

Self-Sealing Covers.

Special angle valves on the inlet and outlet greatly facilitate bypass connections and add much to the appearance of the washer. Modern apparatus and up-to-date gas men are rapidly dispelling the old idea that neatness and cleanliness are useless in a gas works.

They are also realizing the fact that efficiency and cheapness never work well together.

Efficiency.

The question of how much ammonia can be removed in the washer will naturally be asked. This is dependent upon so many factors that the results obtained under named conditions only can be of value.

We have noted a claim that about 40 per cent. of the ammonia entering the scrubbing apparatus is removed by the washer. This may have been the case in some particular instance, but without all the details such statements are not only worthless but are misleading as well.

If a washer is passing only a fraction of its rated capacity, even the cheapest kind of design may remove practically all of the ammonia if weak liquor or water is fed into it.

It is essential that we know volume, temperature and ammonia contents of both the entering gas and scrubbing water and the strength of the resulting liquor.

For ourselves we do not desire to make general, wide-sweeping statements. We have always firmly adhered to the policy of placing all our claims on a conservative basis and of making only such statements as actual tests taken under the working conditions imposed by good practice would warrant.

Our Construction is a Guarantee of Efficiency.

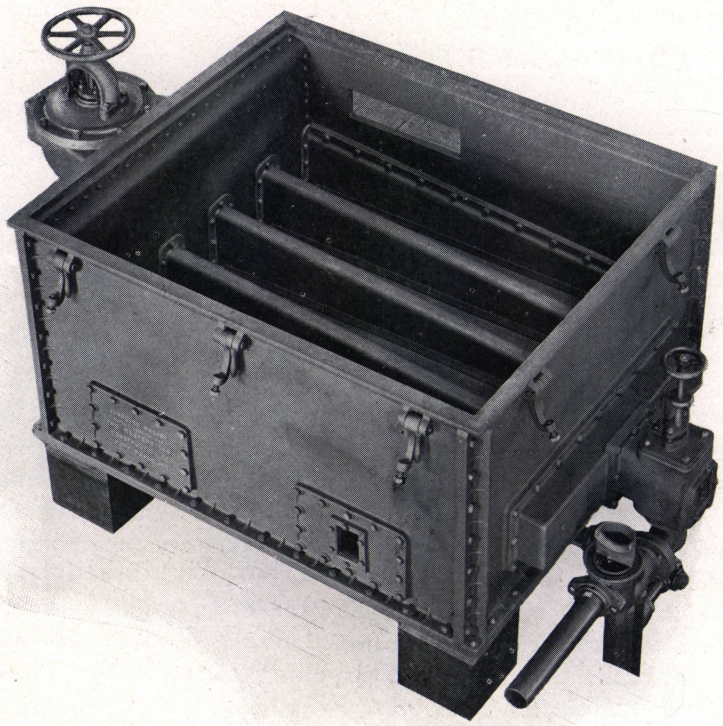


Fig. 6.

We will say, however, that averages of working tests of our apparatus operating at full capacity have shown the removal of about 20 percent of the ammonia entering the washer, when the liquor discharged tested 4 percent: approximately 16 ounces and upward. But equally important is the removal of *all suspended matter* and a large percentage of CO_2 and H_2S.

In a large number of gas works the proper capacity of scrubbers and purifiers is frequently exceeded; in many others such conditions are permanent, as a result of cost of reconstruction or additions, or the necessary ground space not being available. For such conditions as these our Multiple Washer will, in most cases, entirely solve the problem for several years, and in all cases produce decidedly improved conditions, and at a nominal comparative cost. But a washer of highest efficiency is essential, and our *Multiple Washer* is the solution

The washer is made in sizes to meet the requirements of any plant. On page 8 we give a table of sizes, showing floor space required for apparatus and by-pass connections. Figs. 8 and 9, show the various arrangements of inlets and outlets which can be used in connection with this table.

Fig. 7

Two Multiple Ammonia Washers and one water gas washer were included in our exhibit at St. Louis, which was awarded the *Grand Prize*.

Arrangements of
Pipe Connections for
Sizes No. 1 to 6.

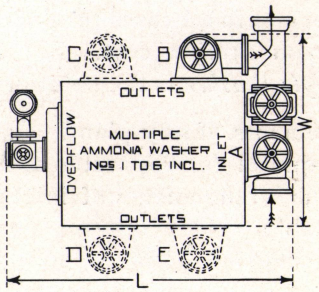


Fig. 8.

Arrangements of
Pipe Connections for
Sizes No. 7 to 11.

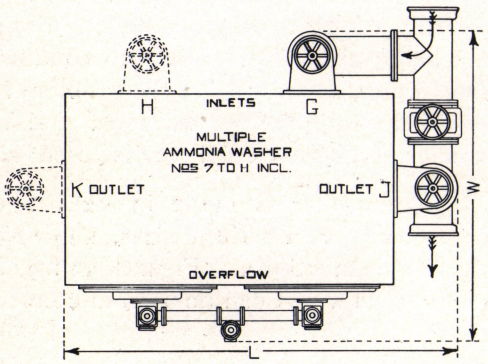


Fig. 9.

TABLE OF SIZES, CAPACITIES, ETC.

No.	Washer. Inside Dimen.	Nominal Capacity Per diem. 2½" to 3" Diff.	Size Connection.	Floor Space With Connections. L	W
1	2'x3'-6"x3'-0"	100,000 cu. ft.	6"	6'-9"	3'-9"
2	3'x3'-6"x3'-0"	200,000 "	6" & 8"	6'-9"	4'-9"
3	3'x5'-0"x3'-6"	350,000 "	8" & 10"	8'-9"	5'-3"
4	4'x5'-0"x3'-6"	600,000 "	10" & 12"	9'-0"	6'-3"
5	5'x6'-0"x3'-6"	950,000 "	12" & 16"	10'-6"	8'-0"
6	6'x7'-0"x3'-6"	1250,000 "	16"	11'-6"	9'-0"
7	8'x7'-0"x4'-0"	1500,000 "	16" & 20"	11'-3"	12'-6"
8	10'x7'-0"x4'-0"	2250,000 "	20"	13'-3"	12'-6"
9	12'x7'-0"x4'-0"	3000,000 "	20" & 24"	15'-3"	12'-6"
10	13'x8'-0"x4'-6"	4000,000 "	24"	16'-9"	13'-9"
11	16'x8'-0"x4'-10"	5000,000 "	30"	29'-3"	13'-9"

When writing for prices please state maximum capacity wanted per diem and also give size of your scrubbers and purifiers, and what style if any tar extractor is used.